

ASE 211 Homework 5

Due: 12:00 noon, Friday, February 25.

1. Work problem 4.4 in the text.

2. Consider the following generalization of problem A3.6. You are given a system of $m + 1$ springs and m blocks. Each spring has a spring constant k_i and unstretched length L_i . The length between the walls is L_w . Write a matlab code which does the following:

a) allows the user to input data k , L and L_w .

b) assembles the matrix A and right hand side \mathbf{b}

c) solves for the distances x_1, \dots, x_m of the blocks using Gauss-Seidel iteration

d) plots the solution \mathbf{x}

Test your code on the following data:

$$\mathbf{k} = (1, 1.5, 3, 4, 2, 2, 4, 6, 8, 1, 9, 1.3, 7, 2, 1, 8, 7)$$

$$\mathbf{L} = (2, 1.5, 5, 3.2, 4, .5, 3, 4, 2, 1.4, 5, 1.1, 2, 2, 2.3, 4.3, 1)$$

and take different values of $L_w = 41$ and $L_w = 47$.

NOTE: The matrix has entries $a_{i,i} = -k_i - k_{i+1}$ on the main diagonal and $a_{i,i+1} = k_{i+1} = a_{i+1,i}$ on the diagonals above and below the main diagonal. All other entries are zero. Be careful with the first row and last row of the matrix. The right hand side has entries $b_i = -k_i L_i + k_{i+1} L_{i+1}$ except for the last entry which is $b_m = -k_m * L_m + k_{m+1}(L_{m+1} - L_w)$.

Hand in all matlab m -files and diaries.